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Marine Mammal Commission
Advisory Committee on Acoustic Impacts
on Marine Mammals:

NGO Evaluation of Specific Impacts

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Impacts of most concern

Baleen whales exposed to low frequency sounds up to 155 dB re 1μPa:

- Change their vocalization rates
- Deviate from their migratory paths
- Displace themselves from one coastal area to another while engaged in breeding behavior
- Lengthen their mating songs

From: Croll et al. 2001; Tyack and Clark 1998; Miller et al. 2000

Beaked whales exposed to mid-frequency sonar:

- Mass strandings of mixed species – very high correlation with nearby naval maneuvers
- Mass strandings of single species – correlation with nearby naval maneuvers
- Injuries and impacts consistent with acoustic trauma/exposure
- Possible displacement

Note: Beaked whale stranding in Baja California correlated with use of air guns

From: Simmonds and Lopez-Jurado 1991; Frantzis 1998; Mead 2000; US Commerce and US Navy 2000; Balcomb and Claridge 2001; Jepson et al. 2003

Other marine animals exposed to anthropogenic noise sources (examples):

- Orcas and harbor porpoises – displaced by high-amplitude acoustic harassment devices
- Pilot whales – change in vocalization rates when exposed to low and mid-frequency sound sources
- Odontocetes and pinnipeds – experienced temporary threshold shifts when exposed to high-amplitude sound
- Fish – experienced internal injuries, eye hemorrhage, ear damage when exposed to low frequency sounds; ears damaged by air guns

From: Bowles et al. 1994; U.K. Defense Research Agency 1994; Kastak et al. 1999; Rendell and Gordon 1999; Schlundt et al. 2000; Morton and Symonds 2002; Olesiuk et al. 2002; McCauley et al. 2003

Concerns with research to date:

In most cases -

- Small sample sizes (in captive, experimental studies, often only one or two animals, meaning individual differences have disproportionate influence)
- Field studies have been short-term and have assessed short-term (behavioral) reactions – little if any longitudinal or multi-year/season follow up – physiological impacts unknown

Concerns (continued):

- Experimental sound characteristics often differ from those of concern (*e.g.*, pure tones vs. broad-band)
- Few data on baleen and beaked whales (most experimental data from captive *Tursiops*, *Delphinapterus* or pinnipeds)

- Difficult to extrapolate from a few individuals to the population level or from one or a few species to many

Translating results into policy:

- In almost all cases, field and experimental studies were logistically constrained to address limited hypotheses, examine limited parameters, and use limited methodologies – appropriately, they also drew limited conclusions
- Nevertheless, results have been broadly interpreted by regulatory agencies to justify a permissive approach to the management of anthropogenic noise in the marine environment
- Many of the same results – and other results not necessarily considered – could be used to justify a far more conservative approach to permitting

The Problem?

(from the NGO perspective)

- The Precautionary Principle would favor a conservative, cautious interpretation of research results to date
- However, regulatory decisions have been non-precautionary and essentially discount evidence of negative impacts that could potentially affect populations

How to address the problem:

Inter alia -

- Apply the Precautionary Principle – establish conservative regulatory standards that do not rely on over-interpretation (or selective extrapolation) of currently available science

- Coordinate research internationally, through academic and other institutions - encourage "cross-pollination" of ideas, including methods

Solutions (continued):

- Design research programs that examine reactions to sound sources longitudinally, over multiple seasons
- Design research programs that examine reactions of as wide a variety of species as is practicable
- Design controlled field studies to augment captive studies as often as is practicable

Solutions (continued):

- Design research programs that consider impacts from sound sources that have to date remained relatively unexamined, *e.g.*, ship noise, wind turbines

- Design monitoring programs that, to the maximum extent practicable, record reactions, including strandings, beyond any "safety" or "exclusion" zone around relevant sound sources

Solutions (continued):

- Establish critical habitat regions/zones where anthropogenic noise sources would be limited or even prohibited
- Establish an internationally coordinated "standard operating procedure" to follow when a mass stranding that may be related to acoustic trauma occurs
- Establish a neutral body to administer funds for relevant research

None of the preceding is a comment on the *quality* but rather the *quantity* of available research results.

Results to date are preliminary – necessary initial steps, but insufficient to adequately inform regulatory decisions.

The goal should be to establish precautionary regulatory standards and mitigation and to make precautionary permitting decisions until we have acquired a broader base of information.

Final comment:

Precautionary ≠ Arbitrary